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(54) Title: METHODS FOR FAST DIAL-ON-DEMAND INTERNET ACCESS WITH ANALOG MODEMS AT USER SIDES, VIA PUBLIC SWITCHED TELEPHONE NETWORKS, ENABLING APPARENT USER'S FULL SESSION-CONTINUITIES			
(57) Abstract			
<p>The methods bypass present lengthy modem renegotiations (typically 20-30 seconds) to effect fast re-establishment of ISO Application-Oriented Layer communication link between user Application Programs/Browsers and Internet Service Provider, and enables complete session continuity without user being aware of noticeable difference due to frequent connections/disconnections of PSTN line. The methods at its most basic essence requires that the reconnecting incoming calls be routed to the same Port #/Modem unit/Data channel.</p>			
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METHODS FOR FAST DIAL-ON-DEMAND INTERNET ACCESS WITH  
ANALOG MODEMS AT USER SIDES, VIA PUBLIC SWITCHED  
TELEPHONE NETWORKS, ENABLING APPARENT USER'S FULL  
SESSION-CONTINUITIES

Fast Dial-on-Demand establishes the physical line connections only upon request from user's application programs (such as web browser) and disconnects when not in use for data transmissions, eliminating requirement for the PSTN connection to be maintained throughout the user session thus achieving substantial cost savings.

The methods presented here bypass present lengthy modem renegotiations (typically 20-30 seconds) to effect fast re-establishment of ISO Application - Oriented Layer communication link between user Application Programs/Browsers and Internet Service Provider, and enables complete session continuity without user being aware of noticable difference due to frequent connections/disconnections of PSTN line.

## METHOD 1

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Internet Service Provider implements a PBX module which monitors incoming calls extracting DTMF Caller-ID (ie caller's phone number) and checks against existing maintained table of modem unit # (or Port #, Data channel)/ Caller-ID to switch the incoming call to the corresponding modem unit (or Port #/Data channel) if found on the table. If not already on the table, it will be treated as a first time dial-up connection, whereupon the usual modem negotiations, authentications and Dynamic IP address assignment will take place and thereafter a new modem unit #(or Port #, data channel)/ Caller-ID entry for this session connection will be created on the Table.

The ISP could set the Idle Period before terminating session to say 15 minutes; if there has been no transmission line activities during this period the user's Dial-on-Demand session will be terminated, the modem unit and Dynamically assigned IP address returned to resource pool, and the corresponding modem unit # (or Port #, data channel) / caller-ID entry removed from Table. This prevents tying up of modem(or Port, datachannel), IP address resources by inactive Dial-on-demand sessions.

The ISP modem setting for elapsed time period before terminating line connection upon NO CARRIER DETECT (ie caused by user Dial-on-demand software package hanging up telephone line when there are no data transmissions) could be set to the same 15 minutes above, to allow for subsequent instantaneous modem reconnections to new incoming calls by the

same user session if within the 15 minutes period after user Dial-on-Demand software package last hanging up on the PSTN line connection.

The user Dial-on-demand software package could be set by user to hang up on the PSTN line connection to ISP after a period of say 45 seconds transmissions inactivity to save on phone costs. Most browsers have webpage access connection time-out of around 30 seconds, ie browsers will abort attempt to download webpage if access to the URL site clicked on was not established by then. Within the next 15 minutes after hanging up whenever the Dial-on-demand software package detects via user's Operating System (eg Telecommunication Application Programming Interface environment of Microsoft Windows Operating systems) user program's request for Internet access, the software package redials the ISP number, whereupon the ISP module checks the incoming Caller-ID against Table of modem unit # (or Port#, Data channel) / Caller-ID to route the incoming call to be connected to the corresponding modem unit (or Port #, data channel) it was previously connected to. The Dial-on-Demand Software Package insulates the user's Application Programs/Browsers from the PSTN line connection/disconnection events : the Application Programs/Browsers could assume the PSTN line is connected all the time.

The user Dial-on-Demand software package could further saves on phone connection costs by immediately hanging up PSTN line when webpages/files download from Internet site is completed, or when browser is not expecting any further incoming response to outgoing transmissions sent. The status/ events are detected by software package from the informations contained in

Operating System (eg Telephony Applications Programming Interface environment of Windows).

The user Dial-on-demand software package could also monitors incoming call's DTMF Caller-ID from ISP during the next 15 minutes above after software package hanging up the PSTN line connection (which signifies that there's incoming data transmission while the PSTN line is hung up after inactivity period of 45 seconds above, were ISP server software incorporated Dialling to user to notify of incoming transmissions for the Session); upon such detection to redial to ISP, whereupon the ISP PBX module effects fast re-establishment of communication link.

The method enables apparent user's full session-continuity , ie HTTP/FTP/TELNET/ONLINE GAMING/AUDIOVISUAL STREAMING continuities.

The method at its most basic essence requires that the reconnecting incoming calls be routed to the same Port #/Modem unit/Data channel (eg to the same DSO of the ISP's PRI). As a very basic workable example (only one of several!) of PBX Module implementation for ISPs with Lucent Technology PortMaster4 and PRI lines (note that there is no modem banks deployed here), all that is required is for the ISP's Telecommunication Service Provider to customise the Exchange Switching Software to suppress the disconnection event and reserve the same DSO of the PRI for Dial-in subscriber to reconnect (identified by Caller-ID) within the said 15 minutes after disconnection. Where subscriber does not reconnect within the said 15

minutes, the Exchange Switching terminates and releases the DSO in the usual manner. The DSO link is treated by ISP as 'live' (thus enabling Dial-in subscriber to reconnect the PSTN line and be immediately Online again to continue the same Session from where was left off retaining the same Session IP address) for 15 minutes after Dial-in subscriber's disconnection, although no datacommunication is possible until Dial-in subscriber reconnects the PSTN line (routed by Exchange Switching Software to the same DSO) within the said 15 minutes.

## METHOD 2

By having a pre-arranged common modem settings, eg specific common connection rate (eg 56KBS), hardware flow control, parity, compression; and installing modified modem drivers to connect at above pre-arranged common settings at both ISP & user modems, lengthy modem negotiation is bypassed for every Dial-ins achieving fast establishment (eg 1 second-4 seconds) of ISO Application-Oriented Layer communication link.

The ISP access authentication server system only needs to maintain/check a table of current Session dynamic IP address assigned / Caller-ID to ensure that the reconnecting user gets assigned the same IP address at every subsequent reconnections if reconnecting within a period of say 1 hour since last PSTN line disconnection ( else the corresponding IP address / Caller-ID entry is removed from Table and the IP is returned to the resource pool ). If the Caller-ID is not on the Table on user dial-in, the server will dynamically assign a new IP address for the session, and create a corresponding current Session dynamic IP address assigned/Caller-ID entry on the Table.

On its own, or together with user Dial-on-demand software package described in Method 1, this Method enables apparent user's full session-continuity, ie HTTP/FTP/TELNET/ONLINE GAMING/AUDIOVISUAL STREAMING continuities.



### METHOD 3

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The ISP maintains a 'State Information' of all users by their Caller-ID. The 'State Information' contains permanent details of user's modem connection settings (eg user specific connection speed/protocol, flow control method, parity, compression method) and details of user's current Dynamically assigned IP address for the Session. The user modem driver is modified to connect at above user specific settings, & an appropriate ISP modem driver is selected corresponding to the incoming Caller-ID & assigned to the ISP modem unit, before the incoming line is picked up by the modem unit, hence doing away with lengthy modem negotiations.

Upon detection of DTMF Caller-ID for the Dial-in to a modem, the ISP server will select an appropriate modem driver & set the modem unit to the user specific modem setting details contained in the Caller-ID's 'State Information' before the modem unit picks up the incoming line thus bypassing lengthy modem negotiations, authenticates user and assigns user with the same IP address entry in the 'State Information' if present. If IP address is absent the ISP access authentication server will dynamically assign a new IP address to user for the Session, and record it in user's current Dynamically assigned Session IP address field of user's 'State Information'. After a pre-set Idle Period of say 1 hour the entry in Session IP address from the field in 'State Information' is removed & the IP address is returned to resource pool ( to prevent excessive tying up of IP resource by inactive

sessions ) , and any subsequent Dial-in will then be assigned a new new Session IP address.

On its own, or together with user Dial-on-Demand software package described in Method 1, this method enables fast establishments (eg 1 second-4 seconds) of ISO Application-Oriented Layer communication link, together with apparent user's full session-continuity, ie HTTP/FTP/TELNET/ONLINE GAMING/AUDIOVISUAL STREAMING continuities.

## NOTES

1. Modem units referred to may be virtual/software modems, eg Lucent Technology PM4 's Modem DSP with PRI lines : the connecting of incoming DSO from PRI to specific Modem DSP could also be effected by assigning incoming DSO to the the same TDM bus time slot of the Modem DSP.
2. The Dial-on-Demand software package is here described for predominantly Internet usage, but is also applicable for use in connection between any two user application programs on two computers connected by analog modems via PSTN line.
3. Method 1 described above may also be applied for users with digital Terminal Adapters instead of analog Modems.

## CLAIMS

1. Method for Dial-on-Demand Internet access with analog modems at user sides, via Public Switched Telephone Networks, enabling session continuity without user being aware of noticable difference due to frequent connections/disconnections of physical PSTN line, said method having the Internet Service Provider implements a PBX module which monitors incoming calls extracting DTMF Caller-ID and checks against existing maintained Table of Modem Unit #(or Port #/Datachannel) / Caller-ID to switch the reconnecting PSTN line to the same Modem Unit #(or Port#/Datachannel) before, the ISP's Modem Unit(or Port/Datachannel) is kept 'live' for a preset time period since last PSTN disconnection enabling Dial-on-Demand users to reconnect the PSTN line within the preset time period and be immediately Online again to continue the same Session from where was left off retaining the same assigned Session IP Address; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physical PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnect the physical PSTN line.

2. A method as claimed in Claim 1, said method having the PBX module implemented by the ISP's Telecommunication Service Provider in the Exchange Switching Software, customising for the ISP access # so that reconnecting calls within a preset time period, based on their Caller-IDs are routed to the same Port # / Datachannel before, the Port # / Datachannel being reserved for the Caller-ID for a preset time period since user last Disconnects; the ISP's Modem Unit(or Port/Datachannel) is kept 'live' for a preset time period since last PSTN disconnection enabling Dial-on-Demand users to reconnect the PSTN line within the preset time period and be immediately Online again to continue the same Session from where was left off retaining the same assigned Session IP Address; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physical PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnect the physical PSTN line.

3. Method for Dial-on-Demand Internet access with analog modems at user sides, via Public Switched Telephone Networks, enabling session continuity without user being aware of noticable difference due to frequent connections/disconnections of physical PSTN line, said method having a pre-arranged common modem connection settings for users to connect to ISP ; the ISP checks a Table of current Session dynamic IP assigned / Caller-ID to ensure the reconnecting user gets assigned the same IP Address at every subsequent reconnections if reconnecting within a preset time period since last physical PSTN line disconnection; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physical PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnects the physical PSTN line.

4. Method for Dial-on-Demand Internet access with analog modems at user sides, via Public Switched Telephone Networks, enabling session continuity without user being aware of noticable difference due to frequent connections/disconnections of physical PSTN line, said method having the ISP maintains a 'State Information' of all users by their Caller-ID containing permanent details of user's specific modem connection settings and details of user's current Dynamically assigned IP Address for the Session, to select/initialise an appropriate ISP Modem Driver corresponding to the incoming Caller-ID before the incoming line is picked up by the modem unit; the ISP assigns reconnecting user with the same Session IP Address as before if reconnecting within a preset time period; user's Dial-on-Demand Software Package reconnects the physical PSTN line whenever user's Application Programs/Browser requires Internet access, and insulates user's Application Programs/Browsers from the PSTN disconnection/reconnection events; the ISP dials to alert user when it needs to transmit data to user and the physical PSTN line is disconnected, user Dial-on-Demand Software Package upon detecting the ISP's Caller-ID dials to reconnect the physical PSTN line.

5. A method as claimed in any of the preceding Claims, in which the method is applied between any two user Application Programs on two computers connected by PSTN line.
6. A method as claimed in any one of Claims 1-3, in which the method is applied to users with digital Terminal Adapters instead of analog Modems.



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(54) Title: METHODS FOR FAST DIAL-ON-DEMAND INTERNET ACCESS WITH ANALOG MODEMS BYPASSING LENGTHY MODEM NEGOTIATIONS

(57) Abstract: The methods bypass present lengthy modem renegotiations (typically 20-30 seconds) to effect fast re-establishment of ISO Application-Oriented Layer communication link between user Application Programs/Browsers and Internet Service Provider, and enables complete session continuity without user being aware of noticeable difference due to frequent connections/disconnections of PSTN line. The methods at its most basic essence requires that the reconnecting incoming calls be routed to the same Port #/Modem unit/Data channel.

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## A. CLASSIFICATION OF SUBJECT MATTER

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 12380 A (TELEFONAKTIEBOLAGET LM PUBL) 11 March 1999 (1999-03-11) page 4, line 6 - line 10 page 14, line 13 - line 29 page 19, line 15 - line 20 ---	1-6
A	WO 97 37458 A (NETSPEED INC) 9 October 1997 (1997-10-09) page 2, line 30 -page 3, line 10 page 10, line 17 - line 23 page 15, line 22 -page 16, line 29 page 19, line 11 - line 30 ---	1-6
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